

# ONIL STOVES —GUATEMALA — USPANTÁN

Document Prepared By Ang Kong Nian

C-Quest Capital Malaysia Limited

<b>Project Title</b>	ONIL Stoves —Guatemala – Uspantán
<b>Version</b>	2.2
<b>Report ID</b>	-
<b>Date of Issue</b>	09-Decembert-2024
<b>Project ID</b>	-
<b>Monitoring Period</b>	20-December-2010 to 31-July-2017
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## 1 PROJECT DETAILS

### 1.1 Summary Description of the Implementation Status of the Project

- **A summary description of the implementation status of the technologies/ measures (eg, plant, equipment, process, or management or conservation measure) included in the project.**

The project involves the distribution and installation of ONIL Stoves for use by households in Guatemala. Before the adoption of the ONIL Stove, households in Guatemala used inefficient, conventional open fire. The ONIL Stove is a fuel-efficient stove that reduces the amount of firewood required by households by up to 58%, compared to the baseline, and results in lower emissions based on its construction. A single ONIL Stove will save 3.837 tons of CO<sub>2e</sub> per year.

The project was included as the first CPA under CDM PoA entitled " ONIL Stoves — Guatemala – Uspantán" (CDM PoA reference number - 8480, CPA reference number – 8480-0001).<sup>1</sup>

The first ONIL Stove was installed on 11 January 2010. Till the end of monitoring period, a total of 11,132 ONIL Stoves was reported installed under the project.

All the data recorded during stove registration process was captured via hard copy of registration card. The information collected is then transferred to a project database.

- **The relevant implementation dates (eg, dates of construction, commissioning, and continued operation periods).**

CDM CPA inclusion

Date of CPA inclusion into PoA	19-December-2012
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Installation of ICS

Date of first ICS installed	11-January-2010
Date of last ICS installed in the database	11-August-2012

First Monitoring Survey

Survey dates for parameters $n_y$ and $SS_y$	01-February-2017 to 28-March-2017
Survey dates for parameter $\eta_{new,y,i}$	28-February-2017 to 16-March-2017

- **The total GHG emission reductions or removals generated in this monitoring period.**

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<sup>1</sup> <https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L>

The project results in a total emission reduction of 193,352 tCO<sub>2e</sub> over the monitoring period of 20 December 2010 to 31 July 2017.

## 1.2 Sectoral Scope and Project Type

The project is categorised under type/category as below:

**a) Sectoral scope:** 03 - Energy demand

**b) Type:** I – Energy efficiency improvement projects

The project is not a grouped project.

## 1.3 Project Proponent

Organization name	HELPS International Incorporated
Contact person	Mr Richard Grinnell
Title	Director of Stove Project and Vice President of International Development
Address	Calzada Atanasio Tzul 21-00 Zona 12, Complejo Empresarial El Cortijo II, Bodega 517, Guatemala.
Telephone	011(502) 2428-6600
Email	richardgrinnell@helpsinternational.com

Organization name	C-Quest Capital LLC
Contact person	Isabel Alegre
Title	Managing Director
Address	1015 18 <sup>th</sup> Street NW Suite 730 Washington, DC 20036 United States of America
Telephone	+1 (202) 416-2400
Email	<a href="mailto:ialgre@cquestcapital.com">ialgre@cquestcapital.com</a>

## 1.4 Other Entities Involved in the Project

Not applicable.

## 1.5 Project Start Date

The start date of this project is January 11, 2010, which is the date when ONIL stoves were first delivered (implementation) after the POA and its first CPA were published for Global Stakeholder Consultation at the UNFCCC website.<sup>2</sup>

## 1.6 Project Crediting Period

20 December 2010 to 19 December 2020, ten years, renewable twice, but not extending beyond December 31, 2034 when the maximum CDM crediting period expires<sup>3</sup>

## 1.7 Project Location

Each SSC-CPA will contain a delineated set of households in which ONIL Stoves have been installed within Guatemala. (CPA Implementer) will record names of end-users and the exact location in the SSC-CPA in the program database. End-user names and locations and stove identification numbers will be collected on stove purchase contracts. The sum of the location of these households as within Guatemala, will define the spatial boundary of the SSC-CPA.

The key geographic location of the applied measure (improved cook stoves) is determined using the database of unique stove IDs, the household addresses, GPS coordinates and owners' names and national ID card numbers. These parameters uniquely identify the household. The CPA boundaries equal Guatemala's borders. The geographic coordinates for Guatemala, the CPA boundary, are: Northernmost point N 17° 48.744894' W 89° 9.902344' (*Reserva de la Biosfera Calakmul*), Westernmost point: N 14° 32.202449' W 92° 13.483887; Southernmost point: N 13° 45.280865' W 90° 7.910156' (*Carretera del Litoral*); Easternmost point: N 15° 43.469738' W 88° 13.872070' (*Carretera 13*).

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<sup>2</sup> As per paragraph 3.11.9 of VCS Standard Version 3.7, "for projects registered under the CDM as a Program of Activities (PoA), each Component Project Activity (CPA) shall be registered with the VCS Program as a separate project accompanied by its associated Program of Activities Design Document... The project start date for such projects is the date on which the first activity under the Program of Activities began reducing or removing GHG emissions. Where the project start date is before 8 March 2011, validation shall be completed within four years of the project start date; (in this case, validation refers to validation of the first CPA under the associated PoA)".

<sup>3</sup> This is in accordance with the VCS standard version 3.7 paragraph 3.8.1 that states "For non-AFOLU projects and ALM projects focusing exclusively on reducing N<sub>2</sub>O, CH<sub>4</sub> and/or fossil-derived CO<sub>2</sub> emissions, the project crediting period shall be a maximum of ten years which may be renewed at most twice." Paragraph 3.8.3 of the standard mentions "Projects registered under other GHG programs are not eligible for VCU issuance beyond the end of the total project crediting period under those programs. For example, a CDM project with a seven year twice renewable project crediting period is not eligible for VCU issuance beyond the end of those 21 years".

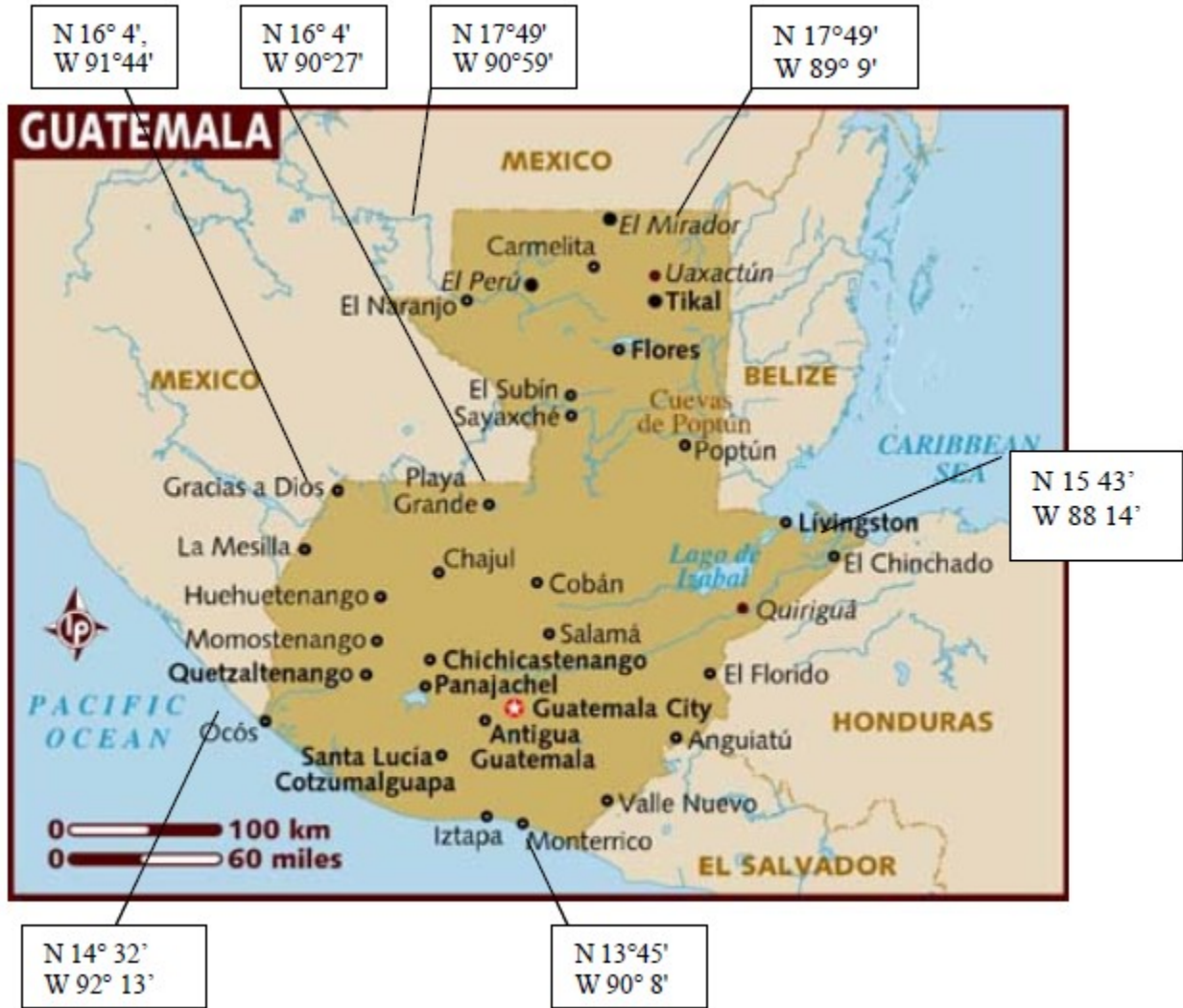


Figure 1. Map of Guatemala, Uspantán CPA<sup>4</sup>

### 1.8 Title and Reference of Methodology

CDM Methodology: AMS-II.G. version 3 - Energy efficiency measures in thermal applications of non-renewable biomass.

<sup>4</sup> [www.lonelyplanet.com/maps/central-america/guatemala/map\\_of\\_guatemala.jpg](http://www.lonelyplanet.com/maps/central-america/guatemala/map_of_guatemala.jpg)

## 1.9 Other Programs

" ONIL Stoves —Guatemala – Uspantán" is registered as a Small-Scale Component Project Activity under the Clean Development Mechanism (CDM) and under the Programme of Activities "Distribution of ONIL Stoves – Guatemala" (Ref. PoA 8480).<sup>5</sup> Evidence has been provided to the Validation and Verification Body that the emissions reductions arising from this program are not double counted under the CDM and VCS.

The project has not been submitted for validation/certification under any other GHG or environmentally related program or mechanism, so it is not eligible to create another form of GHG-related environmental credit other than CERs and VCUs.

## 1.10 Sustainable Development

The following are contributions of the project to sustainable development:

### Environmental sustainability

(i) The project reduces the use of non-renewable biomass:

By adopting the higher efficiency ONIL Stove, households reduce the quantity of fuel wood they must consume for daily cooking needs. When compared to firewood consumption of conventional open fires, the ONIL Stove on average reduces firewood consumption by 58 percent. Since a very high proportion of fuel wood comes from non-renewable sources, this translates directly into reduced emission reductions from non-renewable extraction of wood.

(ii) The project also supports the objectives of national climate change policies and programs.

The Programa Nacional de Cambio Climatico (PNCC) within the Environment Ministry of Guatemala is charged with assessing the risks of climate change and recommending policies to reduce the country's vulnerabilities. The project is in line with the PNCC aim of generating projects within Guatemala that promote forest management, a critical and vulnerable sector identified by the Program. By installing improved cook stoves, households reduce firewood consumption, thus helping maintain forest stocks within the country.

### Economic Sustainability

(i) The project reduces household expenditures:

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<sup>5</sup> CDM document can be accessed through:  
[https://cdm.unfccc.int/ProgrammeOfActivities/poa\\_db/NQIZR3S1J58FLTHUKMB2X6PY07CE49/view](https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/NQIZR3S1J58FLTHUKMB2X6PY07CE49/view) (PoA) and  
[https://cdm.unfccc.int/ProgrammeOfActivities/cpa\\_db/Q158GU3XA9MFE0H2Z6OI4JTNDL7WRP/view](https://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/Q158GU3XA9MFE0H2Z6OI4JTNDL7WRP/view) (CPA 001)

The PoA will contribute significantly to Guatemala economic sustainability through the more efficient use of firewood. Energy savings at both individual household and national levels make important contributions to their economic efficiency and sustainability. The use of the ONIL Stoves will reduce firewood consumption by approximately 58 percent from baseline consumption, significantly reducing household expenditures. By installing improved cook stoves, these households would save significantly on household expenditures related to firewood purchases along with saving time spent gathering firewood, which would free up time for households for other income generating activities. These savings would help improve living conditions for households in Guatemala.

(ii) The project results in creation of new jobs and development of new skill sets:

The ONIL Stove distribution program, which all CPAs will follow, relies on community organizers to facilitate demonstrations and organize training sessions. As these community organizers increase their knowledge about stoves, they often become professional installers and help maintain the stoves in their community. In addition, there are two stove-manufacturing facilities in Guatemala that employ about 20 people each. As uptake of stove technologies spreads, it will allow for expansion of manufacturing facilities to meet increased demand, thus generating more employment opportunities within the country.

### **Social Sustainability**

(i) The project helps to improve health conditions:

There are very tangible and significant health benefits associated with the switch in technology from conventional open fires to improved cook stoves. Traditional cooking methods involve conventional open fires that result in the emissions of local pollutants such as carbon monoxide and particulate matter in often poorly ventilated rooms, which lead to respiratory problems. In addition, conventional open fires are frequent causes of burns and other injuries. Switching from conventional open fires to ONIL Stoves reduces the incidence of such injuries and health problems.

## **2 IMPLEMENTATION STATUS**

### **2.1 Implementation Status of the Project Activity**

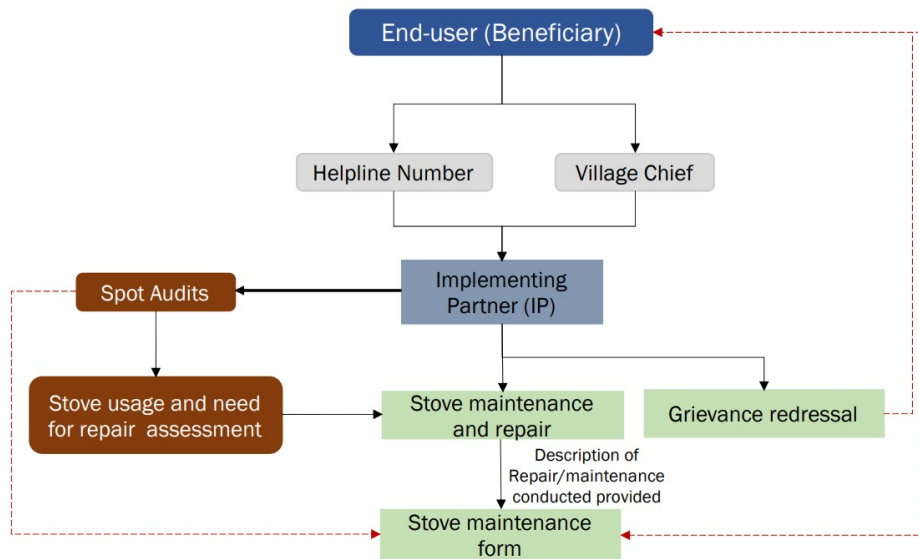
Till the end of the monitoring period, the project installed 11,132 stoves. Only one stove model (ONIL Plancha Stove) was distributed in the project. Before the monitoring period, HELPS International A.C. created an online platform to input and access stove data and user information, as user registration became available.

**Maintenance and upkeep of installed ICS**

PP/ PP representatives ensures the Ips are aware & appropriately trained to construct, maintain, and repair the project stoves. End users are provided with information/details to communicate with IP/PP in case of further assistance/support required in repairing & maintenance of project stoves.

A preventive approach of ‘need-based repair’ and ‘random spot checks’ is adopted to maintain the stoves that have been distributed under this project is optimized by the PP to ensure the longevity of the distributed stoves. The rationale of adopting this approach is that all the beneficiaries were thoroughly trained regarding the usage and maintenance of the stoves. They are properly trained with all the specific details to maintain the stoves which surely ensures proper and high usage of the stoves in the project region.

In addition to regular random spot checks, a stove audit and grievance redressal mechanism has been developed in the project area#. A two-way channel for all the beneficiaries to get their stoves repaired and report any of their grievances and challenges associated with the stove usage has been developed as represented in the following figure.



Information about the availability of a proper communication channel and the details of the contact information is extensively provided to the end-users and posters with all the relevant information is displayed at the major gathering points like schools, municipality offices, central points of villages etc. within the project area to ensure proper dissemination of information. The implementing partner of this project visits the beneficiaries and undertakes the repair work which is formally recorded in a form that captures the details of materials used in repairing the stoves and an undertaking by the end-user to continue usage of the stoves based on the instructions provided by the IP staff.

CDM methodology AMS-II.G version 03 allows the use of a correction factor of 0.95 applied to the overall emissions reductions to account for any possible leakage. This factor has been applied to the emissions reductions presented in this report.

## 2.2 Deviations

### 2.2.1 Methodology Deviations

This project did not apply any methodology deviations.

### 2.2.2 Project Description Deviations

Sampling method. The sampling method applied in the registered monitoring plan is multi-stage sampling. Multi-stage sampling is a sophisticated method which is not easy to be implemented and the data analysis is difficult. Given that the population being studied is relatively homogeneous with respect to the parameter being studied, therefore simple random sampling is chosen to replace the existing sampling method.

## 2.3 Grouped Project

Not applicable. This is not a grouped project.

## 2.4 Safeguards

### 2.4.1 No Net Harm

The ONIL Stove installed under this project presents positive environmental impacts wherever they are applied and no negative environmental impacts have been identified.

### 2.4.2 Local Stakeholder Consultation

The local stakeholder consultation was done at PoA level, prior to the registration of the PoA. The first stakeholder meeting for the POA was conducted in Agua Blanca, Quetzaltenango on 15 December 2009. A series of similar meetings followed this.

The outcomes from the local stakeholder consultation is available in Section D of the PoA-DD<sup>6</sup>.

## 3 DATA AND PARAMETERS

### 3.1 Data and Parameters Available at Validation

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<sup>6</sup> <https://cdm.unfccc.int/UserManagement/FileStorage/V14NBSXWCEKJYO97MUL2P5803QDTAF>

Data / Parameter	<b>B<sub>old</sub></b>
Data unit	Tonnes/year
Description	Quantity of Biomass used in the absence of the project activity (per appliance)
Source of data	Baseline surveys, ex-ante
Value applied:	6.64
Justification of choice of data or description of measurement methods and procedures applied	The baseline survey assessed the average biomass usage per household per annum amongst users of traditional 3-stone fires or traditional pot support, according to interviews in Guatemala.
Purpose of the data	Calculation of baseline and project emissions
Comments	See CDM PoA-DD for more details on the baseline measurement

Data / Parameter	<b>L</b>
Data unit	Fraction
Description	Net to gross adjustment factor to account for leakage
Source of data	Paragraph 13 (a) of the AMS II.G methodology, version 3
Value applied:	0.95
Justification of choice of data or description of measurement methods and procedures applied	A net to gross adjustment factor (0.95 default) is applied in order to adjust B <sub>old</sub> to account for leakages as per paragraph 13 (a) of the AMS II.G, version 3 methodology.
Purpose of the data	Calculation of leakage
Comments	

Data / Parameter	<b>η<sub>old</sub></b>
Data unit	Fraction
Description	Efficiency of the system being replaced
Source of data	Paragraph 6, Option 2 (b) of the AMS II.G methodology, version 3, default
Value applied:	0.10 (default for conventional open fires, as stated in the methodology)
Justification of choice of data or description of measurement methods	Provided as default value since replaced system is conventional open fire.

and procedures applied	
Purpose of the data	Calculation of baseline and project emissions
Comments	

Data / Parameter	$f_{NRB,y}$
Data unit	Fraction
Description	Fraction of non-renewable biomass saved by the project activity
Source of data	FAO, ex-ante, calculated
Value applied:	0.913
Justification of choice of data or description of measurement methods and procedures applied	<p>For biomass savings to be calculated, the portion of biomass used that is renewable must be accounted for based on the methodology. The Guatemalan Institute of Forest publications give the number of hectares of reforested area. This area was multiplied by an expected growth volume of different types of forest (m<sup>3</sup>/ha/yr) and multiplied by an average density of wood, which give the total demonstrably renewable biomass of all the reforested land.</p> <p><math>B_{old}</math> is taken from the baseline survey and adjusted (<math>B_{old}</math>) to account for the quantity of fuel wood used by baseline stoves households that have ONIL and baseline stoves. <math>B_{old}</math>, is then multiplied by the estimated number of homes in Guatemala (1.746 million) that still use open fires to obtain an estimate of the total amount of fuel wood used in Guatemala (<math>B_{oldGuatemala}</math>).</p> <p>NRB is <math>B_{old,Guatemala}</math> (excluding fuel wood used in baseline stoves) minus the DRB component . Then, <math>fNRB = NRB/(NRB + DRB)</math></p>
Purpose of the data	Calculation of baseline and project emissions
Comments	

Data / Parameter	$NCV_{biomass}$
Data unit	TJ/t
Description	Net calorific value of non-renewable biomass that is substituted
Source of data	IPCC default value for fuel wood, ex-ante, AMS II.G methodology, version 3.
Value applied:	0.015 TJ/tonne
Justification of choice of data or description of measurement methods and procedures applied	Default value that is provided in AMS II.G, version 3
Purpose of the data	Calculation of baseline and project emissions

Comments	
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Data / Parameter	EF <sub>projected_fossilfuel</sub>
Data unit	tCO <sub>2</sub> /TJ
Description	Emission factor for the substitution of non-renewable biomass by similar consumers
Source of data	IPCC default value for LPG, <i>ex-ante</i> , AMS II.G methodology, version 3.
Value applied:	81.6 t CO <sub>2</sub> /TJ
Justification of choice of data or description of measurement methods and procedures applied	Default value that is provided in AMS II.G, version 3
Purpose of the data	Calculation of baseline and project emissions
Comments	

### 3.2 Data and Parameters Monitored

Data / Parameter	$n_{y,i}$
Data unit	Quantity
Description	Number of ONIL Stoves in operation during the monitoring period as determined by the monitoring survey. This includes total number of stoves distributed/installed in the entire CPA.
Source of data	ONIL Stove registration data and data from monitoring surveys
Description of measurement methods and procedures to be applied	The percentage of stoves found to be still in operation based on the sampling plan in this monitoring period is applied to the total number of stoves distributed/installed in each CPA included in the sample (according to the ICS registration records in the monitoring database and the applicable sample frame). The proportion of sampled ICS found in operation in this monitoring period was applied to the total number of stoves for each CPA when calculating emission reductions.
Frequency of monitoring/recording	Data from Registration Cards was uploaded to database continuously to come up with the overall number of stoves installed under the CPA. Monitoring surveys captured the fraction of operational ONIL stoves.
Value monitored:	

	<b>Year</b>	<b>Operational stoves</b>
	Year 2010	8,612
	Year 2011	8,612
	Year 2012	8,612
	Year 2013	8,612
	Year 2014	8,612
	Year 2015	8,612
	Year 2016	8,298
	Year 2017	7,893
Monitoring equipment	Monitoring surveys and registration card records loaded into CPA database	
QA/QC procedures to be applied	<p>Staff was trained to obtain unbiased and reliable survey data. Monitoring database was checked for errors. There were four cases in which the stoves were not considered in use despite users affirming using stoves:</p> <ol style="list-style-type: none"> <li>1. When surveyors discovered, based on visual inspections or their observations that a stove was not in use.</li> <li>2. When users had another type of improved cookstove along with the ONIL stove. The measure was taken to prevent double counting with other programs and to accurately estimate emissions reductions (as the presence of another improved cookstove may affect the baseline).</li> <li>3. In cases where there was no prior use of three stone fires. In these cases, the firewood baseline would not be applicable.</li> <li>4. When stoves were modified to operate as three stone fires (e.g. when insulating material and combustion chamber were removed).</li> </ol>	
Purpose of the data	Calculation of baseline and project emissions	
Calculation method	<p>As per the current MP survey 77.36% of stoves were found to be operational. The PP has compared this with secondary data of other projects, stoves in operation and the percentage was 91.30%<sup>7</sup>. However, there was no stove champion data for comparison and hence to gather primary data the PP has conducted survey in 2024 based on Verra 6.1 findings. As per VERRA 6.1 2024 Survey results the operational rate was calculated. The operational stove percentage was used to calculate</p>	

<sup>7</sup> 44.03.05 Stoves in Operation - Verified Secondary Data (2024-08-05).xlsx

	<p>annual deration (loss rate). The annual deration was then applied to calculate year wise stove operational rates<sup>8</sup>. Operational stove percentage was used to calculate number of stoves in operation year wise as below:</p> <p>For Yr 2010 : 77.36% * 11,132 = 8,612          For Yr 2011 : 77.36% * 11,132 = 8,612          For Yr 2012 : 77.36% * 11,132 = 8,612          For Yr 2013 : 77.36% * 11,132 = 8,612          For Yr 2014 : 77.36% * 11,132 = 8,612          For Yr 2015 : 77.36% * 11,132 = 8,612          For Yr 2016 : 74.54% * 11,132 = 8,298          For Yr 2017 : 70.90% * 11,132 = 7,893</p> <p>PP has compared among.</p> <ul style="list-style-type: none"> <li>a) initial MP survey operational rate (77.36%).</li> <li>b) Secondary data (91.3%) and</li> <li>c) Verra 6.1 2024 survey results.</li> </ul> <p>The ER are estimated based on the stoves operational rate at 77.36% on a conservative basis for Yr 2010 to 2015 (lower of MP1 Survey, Secondary data and Verra 6.1 2024 Survey deration rate).</p> <p>For Year 2016 &amp; 2017 considered the lower value among MP1 (77.36%), Secondary data (91.3%) and the VERRA 6.1 2024 survey operational stove determined by deration rate (74.54% (Yr 2016) and 70.90% (Yr 2017) as conservative approach.</p> <p>.</p>
<p>Comments</p>	<p>Stoves that that were used along other types of improved cookstoves, or where the baseline was not applicable (because households were not using three-stone fires prior to the ONIL stove installation or because they were already using another type of improved cookstove) were considered as non-operational and discounted from the fraction of stoves that remain in operation. The removal of these stoves resulted in more conservative emissions reductions estimates.</p>

<sup>8</sup> Excel spread sheet for calculation of Operational stove percentage as per annual deration rate applied is provided to VVB

Data / Parameter	$t_{y,j}$
Data unit	Fraction
Description	Fraction of project's monitoring period the stove is in operation (weeks in operation/total weeks in monitoring period)
Source of data	ONIL Stove registration data in monitoring database and length of monitoring period
Description of measurement methods and procedures to be applied	Calculated from database records
Frequency of monitoring/recording	Continuous monitoring
Value monitored:	0.85 [average]
Monitoring equipment	--
QA/QC procedures to be applied	Cross checks and spot checks in the database to ensure installation/registration dates are correctly captured
Purpose of the data	Calculation of baseline and project emissions
Calculation method	Days in operation during monitoring period divided by total number of days in monitoring period. This calculation is applied to every ONIL stove in the database.
Comments	

Data / Parameter	$\eta_{new,i}$
Data unit	Fraction
Description	Efficiency of the ICS
Source of data	Efficiency tests conducted in monitoring period
Description of measurement methods and procedures to be applied	The Water Boiling Test (WBT) protocol used was the WBT version 4.2.4 published by the Global Alliance for Clean Cookstoves. The WBTs were conducted by trained staff. Stoves were tested at the place of installation (i.e. in stove user households) using firewood available in the same households. Each sampled stove was tested once for the cold start phase, hot start phase and simmer phase. The staff ensured the stoves were at room temperature before applying cold start tests. Each test used two aluminium pots with 2.5 litres of water in each. Testers supplied clean water to the households where tests were conducted. Pots were put in direct contact with fire by removing the metal rings around the stove burners. Boiling point temperatures used in calculations were adjusted based on altitude that was taken with GPS instruments. The calorific value of the different species of wood was taken from the literature, where available. When not available in the literature, a

	broader distinction was made between softwoods and hardwoods and average values of these types of woods were applied accordingly to the species of wood for which data was unavailable.																		
Frequency of monitoring/recording	Water Boiling Tests were implemented over stove samples of Vintages 1, 2, 3, 4, 5, 6, 7 and 8.																		
Value monitored:	<table border="1"> <thead> <tr> <th>Vintage</th> <th>Efficiency</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.2533</td> </tr> <tr> <td>2</td> <td>0.2300</td> </tr> <tr> <td>3</td> <td>0.2186</td> </tr> <tr> <td>4</td> <td>0.2390</td> </tr> <tr> <td>5</td> <td>0.2305</td> </tr> <tr> <td>6</td> <td>0.2276</td> </tr> <tr> <td>7</td> <td>0.2214</td> </tr> <tr> <td>8</td> <td>0.2081</td> </tr> </tbody> </table>	Vintage	Efficiency	1	0.2533	2	0.2300	3	0.2186	4	0.2390	5	0.2305	6	0.2276	7	0.2214	8	0.2081
Vintage	Efficiency																		
1	0.2533																		
2	0.2300																		
3	0.2186																		
4	0.2390																		
5	0.2305																		
6	0.2276																		
7	0.2214																		
8	0.2081																		
Monitoring equipment	<ul style="list-style-type: none"> <li>• Digital scales</li> <li>• Firewood moisture meters</li> <li>• Digital thermometers</li> <li>• Thermocouples</li> </ul>																		
QA/QC procedures to be applied	WBT version 4.2.4 A check was performed for outliers, but none were found (defined as those thermal efficiency values 3 standard deviations above or below the vintage sample mean, as per the CDM PoA-DD section E.7.2).																		
Purpose of the data	Calculation of project emissions																		
Calculation method	WBT version 4.2.4 calculation methods.																		
Comments																			

Data / Parameter	SS <sub>y</sub>
Data unit	Fraction
Description	The fraction of ongoing baseline stove use within the population of in-use ONIL Stoves during a monitoring period.
Source of data	ONIL Stove registration data and data from monitoring surveys.
Description of measurement methods and procedures to be applied	A survey asked for usage of baseline stoves as per the monitoring plan outlined in Section E.7.2 of the PoA-DD. SS <sub>y</sub> was calculated in each monitoring period as follows: the number of sampled households with operational ICS that also continue to use a baseline stove divided by the total number of operational ICS in the sample. This parameter was used to calculate the ex-post baseline adjustment factor in each monitoring period, as outlined in section E.6.2 of the PoA-DD.
Frequency of monitoring/recording	Once per monitoring period
Value monitored:	24.78%

Monitoring equipment	Surveys
QA/QC procedures to be applied	Data for this parameter was collected using the same survey for the fraction of $n_{y,j}$ (appliances in operation) conducted by trained project staff members.
Purpose of the data	Calculation of baseline and project emissions
Calculation method	The number of households with operational ONIL stoves and continuing to use baseline stoves divided by the total number of households with operational ONIL Stoves.
Comments	-

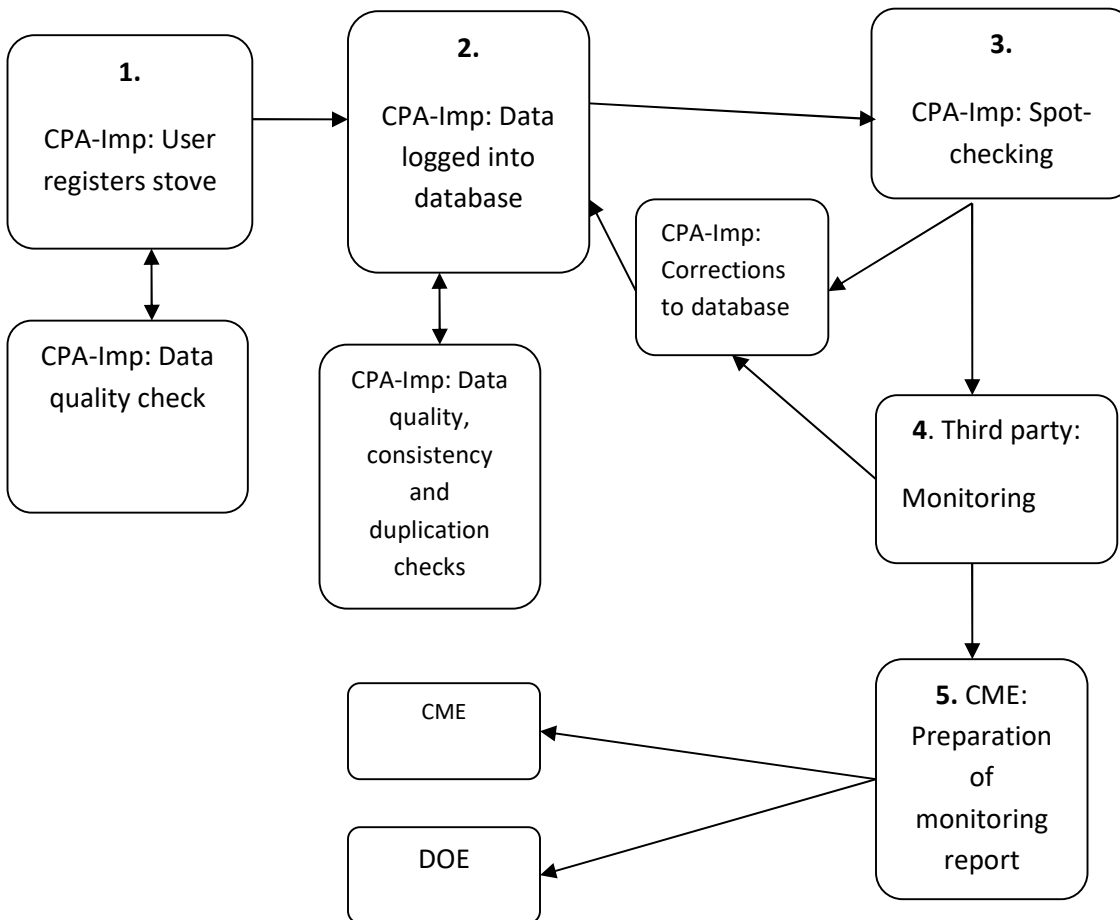
Data / Parameter	<b>B<sub>old adjusted</sub></b>
Data unit	Tonnes/year
Description	If baseline stoves continue to be used, adjustment ensures that fuel wood consumption of those stoves is excluded from B <sub>old</sub> .
Source of data	Baseline survey, <i>ex-ante</i> ; monitoring survey <i>ex-post</i>
Description of measurement methods and procedures to be applied	<p>II.G/Version 3, requires that monitoring ensures that (a) Either the replaced low efficiency appliances are disposed of and not used within the boundary or within the region; or (b) If baseline stoves continue to be used, monitoring shall ensure that the fuel-wood consumption of those stoves is prorated in B<sub>old</sub>. Since HELPS International cannot require end users to dispose of stoves, option (b) is used and the wood used for any baselines stoves that continue to be in use was discounted from B<sub>old</sub>.</p> <p>The secondary stove survey captured the number of households using a baseline stove in addition to the ONIL stove. The survey also recorded the amount of woody biomass consumed by baseline stoves in households with ONIL Stoves. This last metric is multiplied by the proportion of households using baseline and ONIL stoves and then subtracted from B<sub>old</sub> to adjust the baseline woody biomass consumption.</p>
Frequency of monitoring/recording	Once per monitoring period
Value monitored:	6.1934
Monitoring equipment	-
QA/QC procedures to be applied	Data for this parameter was collected using the same survey for the fraction of SS <sub>y</sub> conducted by trained project staff members.
Purpose of the data	Calculation of baseline and project emissions
Calculation method	<p>To be calculated using the formula below:</p> $B_{old\_adjusted} = B_{old} - 0.31 * SS_y / 0.172$ $= 6.64 - 0.31 * 0.2478 / 0.172$

	= 6.1934
Comments	-

### 3.3 Monitoring Plan

The project’s monitoring system follows the monitoring plan described in section E.7.2 of the PoA.

Organizational structure, responsibilities and competencies: To obtain the monitoring variables, the CPA implementer follows the steps, organizational structure and responsibilities in the flow chart below. Appendix 1 contains description of monitoring personnel competencies.



The CME coordinated, managed and assisted HELPS international A.C. and monitoring third parties with each element of the monitoring plan. Details of the monitoring steps on the flowchart are the following:

- 1. HELPS international A.C.: User registered stove.** HELPS International A.C. field personnel collected the information in the Registration Card from the users. Information was collected via a Registration Card filled by HELPS International A.C. staff and partner organizations. HELPS

- International A.C. staff double-checked the accuracy of the information and requested clarifications if needed.
2. **HELPS international A.C.: Data logged into database.** HELPS International A.C.'s trained staff inputted the information from the Registration Card into the database. HELPS International A.C. and CQC checked the database records and removed duplicates (this included completing the serial number, checking for name duplicates, etc...).
  3. **HELPS international A.C.: Spot-checks (ongoing).**<sup>9</sup> HELPS International A.C. visited locations in the field and reported updates to office either via telephone or forms. HELPS International A.C. personnel corrected the database and clearly marked stoves that were not installed, were given away, the end user died or left town, or had any other issues that made the stove no longer eligible to participate in the CPA. These stoves were excluded from the emission reduction calculations.
  4. **Third Parties: Monitoring.** Third Parties followed the sampling plan outlined in the PoA-DD (Section E.7.2) and reported in section D.2 below.
  5. **CME Preparation of monitoring report.** CQC prepared the final monitoring report and retained copies of the document.

Data measuring, recording Method and Implementation of Sampling Approaches

Steps 1, 2 and 3 captured end user information and populated the database, as well as provided database quality control.

Step 4 involves creating sampling surveys to capture data on continuous use of stove ( $n_{y,j}$ ) and use of baseline systems along with ICS ( $SS_y$ ) as well as stove thermal efficiency ( $\eta_{new,i}$ ) as described in the table below.

Parameter	Description of Parameter	Sampling approach (outcome in brackets)
$n_{y,j}$	Proportion of ONIL Stoves still in operation	Visual inspection of the premises to see if ONIL stove is operational and in use. Interview with end user if required to verify that ONIL stove is still in use [Yes/No]
$SS_y$	Percentage of continued baseline stove use among ONIL stove households in the database	Interview with end user and visual inspection to determine if a baseline (replaced) stove is still being used in addition to ONIL stove [Yes/No]
$\eta_{new,i}$	Thermal Efficiency of operational ONIL Stoves	ONIL Stoves were tested using WBTs [ONIL stove thermal efficiency]

Sampling captured information on monitoring variables with required confidence/precision<sup>10</sup> and used simple random sampling (as per of EB 69 Annex 5 Section E). The method involved the grouping of ONIL

<sup>9</sup> PPs presented the DOE with evidences that spot checks were performed independently from monitoring during monitoring period.

<sup>10</sup> According to paragraph 22 of Methodology AMS-II.G version 03, 95/10 confidence/precision for annual and 95/5 for biennial sampling across CPAs. In case a single CPA is sampled, 90/10 confidence/precision for annual and 95/5 confidence/precision shall be required for biennial sampling.

stoves by implementer and model and randomly selecting villages to sample. further the stoves within the selected municipalities were also randomly selected. Since all stoves were of the same model and managed by the same CPA Implementer, no further stratification was needed to capture parameter  $n_{y,i}$  and  $SS_y$  data. Stoves were divided into three Primary Sampling Units for  $\eta_{new,i}$  (stoves managed by same CPA Implementer, of the same model and vintage) given that multiple stove vintages were present. Each stove vintage was sampled separately using the simple random sampling method described below.

Step 5 involved monitoring analyses and accuracy and precision checks. The CPA implementer and CME scrutinized the monitoring data to confirm accuracy of results, analyzed the data, and estimated the resulting emissions reductions outlined in this monitoring report.

The following parameters were obtained through sampling:

1.  $n_{y,i}$ : proportion of stoves in operation
2.  $SS_y$ : fraction of households that continue to use baseline systems (3-stone fires) along with ONIL stoves
3.  $\eta_{new,i}$ : thermal efficiency of ONIL Stoves

simple random sampling was used for all monitoring parameters in accordance with the Sampling Plan of section E.7.2 of the PoA-DD. The objective was to obtain reliable and unbiased estimates of the monitoring parameters. Reliability levels were set at 95% confidence and 5% precision as per AMS II.G version 3, paragraph 22 for biennial sampling.

A single homogeneous population (Primary Sampling Unit, as per PoA-DD) was considered for  $n_{y,i}$  and  $SS_y$  (proportion parameters) since the CPA Implementer and stove model (HELPS International A.C. and ONIL Stove respectively) were the same throughout the CPA. The sampling was carried out at PoA level which comprises of CPA 001 and CPA 002. Eight sampling populations (Primary Sampling Units) were considered for parameter  $\eta_{new,i}$ : stoves from Vintages 1 to 8. No other vintages were included in the PoA since these eight populations comprise the entire PoA.

The following table summarizes the sample sizes and results.

Monitored Parameter	Sample size	Survey Results	Precision achieved
Proportion of stoves in operation ( $n_{y,i}$ )	561	0.7736	Yes
Stoves in operation ( $SS_y$ )	561	0.2478	Yes

Monitored Parameter	Sample size	Test results	Precision achieved
Efficiency of Vintage 1 ONIL Stove vintage	7	0.2533	Yes
Efficiency of Vintage 2 ONIL Stove vintage	7	0.2300	Yes
Efficiency of Vintage 3 ONIL Stove vintage	7	0.2186	Yes
Efficiency of Vintage 4 ONIL Stove vintage	7	0.2390	Yes

Efficiency of Vintage 5 ONIL Stove vintage	7	0.2305	Yes
Efficiency of Vintage 6 ONIL Stove vintage	7	0.2276	Yes
Efficiency of Vintage 7 ONIL Stove vintage	7	0.2214	Yes
Efficiency of Vintage 8 ONIL Stove vintage	7	0.2081	

As per the current MP survey 77.36% of stoves were found to be operational. The PP has compared this with secondary data of other projects, stoves in operation and the percentage was 91.30%<sup>11</sup>. However, there was no stove champion data for comparison and hence to gather primary data the PP has conducted survey in 2024 based on Verra 6.1 findings. As per VERRA 6.1 2024 Survey results the operational rate was calculated. The operational stove percentage was used to calculate annual deration (loss rate). The annual deration was then applied to calculate year wise stove operational rates<sup>12</sup>.

PP has compared among.

- a) initial MP survey operational rate (77.36%).
- b) Secondary data (91.3%) and
- c) Verra 6.1 2024 survey results.

The ER are estimated based on year wise operational rate considering conservative approach.

Implementation and quality assurance and control and procedures used for handling any internal auditing performed and any non-conformities identified: CME trained monitoring personnel on monitoring procedures, including provisions for maximizing response rates, documenting out-of-population cases, refusals and other sources of non-response. The monitoring survey included several questions to support the information on the key monitoring parameters. These included visual inspections to confirm stove use and presence of baseline stoves, comments by surveyors, check of randomly selected households against actual household information, and refusal tracking. These strategies aimed at minimizing surveyor or non-response biases. The questionnaire was piloted in the field prior to implementation.

CME also scrutinized the data to check for inconsistencies and cases of non-response which indicate the stoves are no longer in use (e.g. where surveyors could see an abandoned ONIL Stove or when the user emigrated and could no longer be found). Records were flagged and fixed accordingly.

WBTs were managed by third-party technicians trained in proper WBT implementation. WBT records were checked for data points above or below three standard deviations from the mean, as per section E.7.2 of the PoA-DD. However, no records above or below 3 standard deviations away from the mean were found.

Monitoring staff also certified lack of conflicts of interest and agreement with the monitoring procedures.

<sup>11</sup> 44.03.05 Stoves in Operation - Verified Secondary Data (2024-08-05).xlsx

<sup>12</sup> Excel spread sheet for calculation of Operational stove percentage as per annual deration rate applied is provided to VVB

## 4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

### 4.1 Baseline Emissions

Emissions reductions can be calculated as per methodology AMS-II.G version 3 using the following equations:

$$ER_y = B_{y,savings} * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel} * L$$

Where:

$ER_y$	Emissions reductions during the year in tCO <sub>2</sub> e
$B_{y,savings}$	Quantity of woody biomass that is saved in tonnes
$f_{NRB,y}$	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass (0.87)
$NCV_{biomass}$	Net calorific value of non-renewable woody biomass that is substituted (IPCC default value for fuel wood 0.015 TJ/tonne)
$EF_{projected\_fossilfuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO <sub>2</sub> /TJ
$L$	A net to gross adjustment factor (0.95 default) is applied above (equation (1) of AMS II.G, version 3) in order to adjust $B_{old}$ to account for leakages as per paragraph 13 (a) of the methodology.

To calculate  $B_{y,savings}$ , we use Option 2<sup>13</sup>

$$B_{y,savings} = B_{old} * \left(1 - \frac{\eta_{old}}{\eta_{new}}\right)$$

Where:

$B_{old}$	Quantity of wood fuel used in the absence of the project activity in tonnes
$\eta_{old}$	A default value of 0.10 may be optionally used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney
$\eta_{new}$	Efficiency of the system being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol.

And

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<sup>13</sup> Paragraph 6 of AMS II.G

$$B_{y,savings} = B_{old,adjusted} \cdot \left[ \sum_{i=1}^n N_{y,i} \left( 1 - \frac{\eta_{old}}{\eta_{new,i}} \right) \right]$$

Where:

- $N_{y,i}$  Total number of stoves in operation for a full monitoring period equivalent in the project
- $\eta_{old}$  Efficiency of the baseline system/s being replaced. The 0.10 default value is used as the replaced systems are three-stone fires or conventional systems lacking improved combustion air supply mechanism and flue gas ventilation system i.e., traditional stoves.
- $\eta_{new,i}$  Efficiency of the system being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol.

$$\eta_{old} = 0.10$$

$$\eta_{new,1} = 0.2533$$

$$\eta_{new,2} = 0.2300$$

$$\eta_{new,3} = 0.2186$$

$$\eta_{new,4} = 0.2390$$

$$\eta_{new,5} = 0.2305$$

$$\eta_{new,6} = 0.2276$$

$$\eta_{new,7} = 0.2214$$

$$\eta_{new,8} = 0.2081$$

The full set of emission reductions calculation is provided in Excel spread sheet.

## 4.2 Project Emissions

Not applicable.

## 4.3 Leakage

Not applicable.

## 4.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO <sub>2</sub> e)	Project emissions or removals (tCO <sub>2</sub> e)	Leakage emissions (tCO <sub>2</sub> e)	Net GHG emission reductions or removals (tCO <sub>2</sub> e)
20-December-2010 to 31-December-2010	351	0	0	351
01-Jan-2011 to 31-January-2011	18,630	0	0	18,630
01-Jan-2012 to 31-January-2012	30,666	0	0	30,666
01-Jan-2013 to 31-January-2013	31,698	0	0	31,698
01-Jan-2014 to 31-January-2014	32,045	0	0	32,045
01-Jan-2015 to 31-January-2015	32,367	0	0	32,367
01-Jan-2016 to 31-January-2016	30,814	0	0	30,814
01-Jan-2017 to 31-July-2017	16,781	0	0	16,781
<b>Total</b>	<b>193,352</b>	<b>0</b>	<b>0</b>	<b>193,352</b>